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# The global impact of disproportionate vaccination coverage on COVID-19 mortality



Over the course of the first year of COVID-19 vaccination, between Dec 8, 2020, and Dec 8, 2021, 8·33 billion doses were administered among 4·36 billion people globally.<sup>1</sup> In their study in *The Lancet Infectious Diseases*, by fitting a mathematical model to excess mortality, Oliver J Watson and colleagues<sup>2</sup> estimated that in 185 countries and territories 31·4 million COVID-19-related deaths would have occurred during this timeframe in the absence of COVID-19 vaccination. They estimated that 19·8 million deaths were averted by COVID-19 vaccination. Consequently, the number of lives saved by COVID-19 vaccination markedly exceeded the death toll that has occurred. Nonetheless, even more lives could have been saved by improving the equitability of vaccination coverage worldwide. Specifically, an estimated 156 900 additional deaths would have been averted if the COVID-19 Vaccines Global Access (COVAX) Facility's vaccination target of 20% (for each Advance Market Commitment country) had been attained, and an estimated 599 300 additional deaths would have been averted if WHO's 2021 COVID-19 vaccination target of 40% (for each country) had been attained.<sup>2</sup> Meeting these targets, particularly in low-income countries, is challenged by myriad obstacles that require international support to overcome.

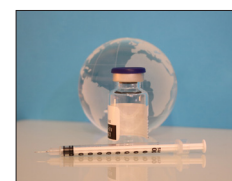
The primary barrier is the lack of access to vaccines due to a combination of restricted supply and funding in resource-constrained settings. Several high-income countries secured advanced purchasing agreements with vaccine manufacturers.<sup>3,4</sup> In the case of the USA, the number of vaccine doses purchased even before production was enough to fully vaccinate its entire population three times over.<sup>4</sup> By contrast, low-income countries were unable to pay the premium prices negotiated by high-income countries, delaying the delivery of vaccines.<sup>3,4</sup> In Burundi, for example, vaccine rollout was initiated 10 months later than in the USA.<sup>1</sup>

The inequitable distribution of vaccines has prolonged the pandemic, and exacerbated the probability and frequency of the emergence of variants of concern. Additionally, many of these novel variants evade host immunity, thereby eroding vaccine efficacy, as well as increasing transmissibility. Given the rapid global

dissemination of these variants, the worldwide burden of morbidity and mortality due to COVID-19 is thereby affected. Provision of vaccine doses from high-income to lower-income countries is therefore not only moral but also pragmatic. The G7 countries have failed to meet their 2021 commitments for donation of vaccines, with the delivery of respective commitments to low-income countries and middle-income countries ranging from 31% by Japan to 8% by Canada.<sup>3</sup> Concerningly, contentious negotiations between political parties in the US Senate have resulted in the exclusion of financing for international COVID-19 vaccination, imperiling global vaccination aid programmes.<sup>5</sup>

Beyond the donation of vaccines to low-income countries, vaccine distribution infrastructure is fundamental to achieving vaccination coverage targets. For instance, more than 1·3 million donated doses were returned by the Democratic Republic of the Congo's Government and more than 114 000 doses expired because of an inability to maintain cold-chain storage and administration of vaccines.<sup>6</sup> Consequently, vaccination coverage of only 0·07% was achieved in the Democratic Republic of the Congo by December, 2021. The model created by Watson and colleagues<sup>2</sup> estimates that if the WHO vaccination target had been met, 32 070 additional lives could have been saved in the Democratic Republic of the Congo (country estimates are provided in the appendix of the Article).

Vaccine hesitancy is an increasingly pervasive challenge across the world. Within Nigeria, for example, vaccine misinformation has been widespread,<sup>7</sup> leading to vaccination coverage of only 1·82%. Watson and colleagues<sup>2</sup> estimate that if the WHO-targeted coverage of 40% had been achieved in Nigeria, 96 420 additional deaths could have been averted. Vaccine misinformation has also affected high-income countries, such as the USA, where public health responses to COVID-19 have become politically polarised.<sup>8</sup> Transparency during evidence-based vaccine approval processes is fundamental to trust. If vaccine refusal remains entrenched, mandates might become necessary to protect individuals, reduce SARS-CoV-2 transmission, and mitigate the emergence of more virulent variants.



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Vaccination programmes have also been disrupted by violent conflict. For example, aid agencies have been unable to distribute COVID-19 vaccines, among other vaccines, in Houthi-controlled regions of Yemen.<sup>9</sup> Similarly, there has been cessation of vaccination in areas of Ukraine targeted by the Russian invasion.<sup>10</sup> Watson and colleagues<sup>2</sup> estimate that if the WHO targeted coverage of 40% had been achieved, 14 230 additional lives could have been saved in Yemen and 19 300 additional lives could have been saved in Ukraine.

The saving of more than 19 million lives by the unprecedented rapidity of development and roll-out of COVID-19 vaccines is an extraordinary global health feat. Nonetheless, millions of additional lives could have been saved by more equitable distribution of vaccines. The most effective approaches to promote vaccination coverage worldwide are multifaceted, requiring improvements in vaccine supply, cold-chain operations, and public confidence. High coverage in an individual country not only benefits that country but contributes to a worldwide reduction in SARS-CoV-2 transmission and emergence of novel variants. An enduring collective response is both pragmatic and ethically imperative.

We declare no competing interests.

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